For forested wetlands, evapotranspiration was measured at 1.8 times open water evaporation in a New Hampshire wetland.[3] An evapotranspiration/ lake evaporation ratiosummary for typical wetland herbs was published by Boyd[4] but note that his own measured ratios require a correction from pan evaporation to lake evaporation, so his own water loss ratios require a significant revision upwards. Without returning to the original references he quotes in the lower part of Boyd's table 2, similar upwards adjustments may be required to ratios if pan evaporation was used rather than lake evaporation. The cattail environments referenced in Boyd's table 2, had evapotranspiration rates that ranged from 1.75 to 2.5 times local lake evaporation, with an average ratio of 2.0. Thus while rates are variable depending on physical settings, emergent wetlands from cattails to wooded swamps are consistently reported as losing more water to the atmosphere than open water lake evaporation. Note also in this study, the statements that only plants that cover water surfaces such as duckweed and water lilies consistently reduce the water lost compared to open water surfaces.

To relate these ratios to the state of Michigan where the court sites are based, I used the precipitation and lake evaporation from the Central Michigan area around Lansing, Michigan.[5] The results are presented on the next page.

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3 Hall, F.R. *et al.*, *The Influence of a New England Wetland on Water Quantity and Quality*; Research Report #4, Water Resource Research Center, University of NH, Durham NH. 1972.

4 Boyd, C.E.; *Evapotranspiration/ Evaporation Ratios for Aquatic Plants*; Journal of Aquatic Plant Management, Vol. 25, pp. 1-3. January 1987.

5 *Climatic Atlas of the United States*, U.S. Dept. of Commerce, National Climatic Center, Ashville, NC, reprinted 1979.

- Average annual precipitation = **31.5** inches per year
- Average annual lake evaporation = **30.25** inches per year
- Cattail marshes range from = 30.25 x 1.75 = **52.94** in/yr
  to 30.25 x 3.0 = **90.75** in/yr. inches per year.
- Wooded swamp water loss = 30.25 x 1.8 = **54.45** in/yr.

Thus all of these wetland types are net sinks for water and cannot contribute to the value of navigable waters because they lose more water to the atmosphere than they receive as precipitation. Given their negative impact on navigable waters, they should not be jurisdictional or categorized as regulated "Waters of the United States" for any transportation or commerce activities.

In terms of altering emergent vegetated wetlands which abut open water bodies that serve as navigable waters in some context, it is to be stressed that both filling or excavation can enhance water release to downgradient surface waters. Excavation into a permanent pond begins to add water to the downgradient navigable waters, while filling wetlands to create upland status actually increases the available water for all downgradient surface waters even more than excavation does. Note that mean annual runoff for central Michigan is about 10 inches per year, and thus conversion of an wooded wetland to an upland would add about to 33 inches of new available water for all downgradient navigable waters due to 10 inches of new upland runoff plus another 23 inches of elimination of excess evapotranspiration.

As mentioned earlier, plants that cover the surface of standing water reduce lake evaporation. However, those areas are classed as shallow marsh wetlands in standing water, and do not function as emergent wetlands which are growing on unflooded saturated soils for most of the year. Note that some ponded water wetlands, dominated by mostly submerged aquatic weeds are also valuable as navigable waters and water supply for downstream areas depending on dominant plant types. Other open water

areas dominated by different aquatic plant types can be uses as navigable waters in spite of functioning as net sinks for water.[4] The only other wetland type that does not offer water losses at rates less than open water evaporation are sphagnum moss type bogs with peat deposits. In these bogs, water losses are at a ratio of about 0.9 times local lake evaporation.

SECONDARY WETLAND FUNCTIONS

As a final matter, there may be some people who might wish to suggest to the Court the idea that other values of emergent vegetated wetlands somehow should apply to the commerce clause or navigable waters. These likely concepts are very briefly reviewed below.

Water Quality. Based on my 30 years of sampling water quality in New England, I have yet to find a wetland that improved water quality. I measured the pH (acidity) of water coming out of one wetland, and the water was so acid it could kill fish. Once peat formation starts in forested wetlands, the water coming out of the wetland is so brown it is called New England tea. Note that this brown water contains tannic acid which is a proven carcinogen. In terms of actual function, clean naturally filtered groundwater is what enters the wetlands from the upgradient side, with colors typically of around 10 color units. However, even small wetlands releasing this water after it passes through the wetland soil can produce colors in excess of 100 color units. One moderate size wetland I tested had a water color that was beyond the instrument's scale of 500 color units.

As for heavy metal uptake by the plants in vegetated wetlands, it can be of nominal value in case of a large release. However, thereafter the plants keep recycling the heavy metals, and to the extent that the plants are eaten by wildlife, the metals are returned to the ecosystem. Due to this constant uptake by live plants and release at the soil surface by dying plants, this explains why heavy metal

concentrations are maintained near the surface of wetland soils and not buried at depth as some people postulate.

Wetlands Protecting Water Bodies from Upland Sedimentation. Most people know that open water bodies fill by accumulation of leaves from trees, and deposits from water lilies, aquatic plants, and cattails. As an example, when my grandfather was a teenager, he planted water lilies for his mother in Carr's Cove on Cayuga Lake in New York. He dove into the water that was almost six feet deep to plant the water lilys. About 50 years later when I was about 12 years old, I found that it was very difficult to row across the water lily portion of Carr's Cove because of the muck generated by the water lilies was touching the bottom of the small rowboat. In addition, cattails and the giant reed *Phragmites* soon invaded the edge of the lake on the water-lily muck, and the major portions of the cove edges lost any ability to be used a navigable water. Thus direct deposition of mineral soils is frequently less than organic muck formation in most water bodies surrounded by wetlands.

Flood Control. Vegetated wetlands soon start accumulating organic matter known as peat. The average rate of peat accumulation formed outside of standing water is 4 inches per 100 years. Thus, even in a drainage basin with zero land use changes to increase flooding, the peat accumulation process raises floodplains in areas dominated by vegetated wetland by about 4 inches per 100 years.

Note also, that once peat formation starts, the organic soils soon develop extremely low permeabilities. Thus once the soils are impacted by rain, they tend to stay full of water, and the void spaces in the soils are not available forstorage of flood waters. Figure 1 on page 8 shows water flow monitoring conducted in two adjacent wetlands.[6]

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6 Heikurinen, L.; Comparison Between Runoff Conditions on a Virgin Peatland and a Forest Drainage Area" Proceedings of the 5th International Peat Congress, Vol. 1, pp 76-86, Wydawnictwa Czasopism Technicznych Not, Warsaw, Poland 1976.

Figure 1 shows that the virgin wetland (with flows represented by circles) which had not been altered by man in its recent history, released no water during dry periods, and released a large peak flow which created significant downstream flooding following a large rain storm. In contrast, the adjacent wetland, managed by wide-spaced ditching that kept the wetland intact as a wetland forest (with flows represented by squares), allowed drainage between rain fall events. The managed wetland had continuous outflow even during dry periods, and the flood peak from the same storm was 40% lower than the peak flood flows from the virgin wetland. This proves that mature unmanaged wetlands are not valuable for (1) for water supply for downstream navigable waters, or (2) flood control.

The message for all parties is that the Unites States does not benefit from protection of emergent vegetated wetlands, but can significantly benefit from science based wetland stewardship.

CONCLUSION

Open waters are in and of themselves useful as navigable waters for commerce. Shallow water wetlands such as areas dominated by water lilies or duckweed are also useful as water supplies for downgradient open waters. Some areas dominated by other partially submerged aquatic plants are functional navigable waters, but those areas may have a negative downstream impact by becoming a sink for water to downstream areas. These ponded water bodies remain useful as navigable waters except if isolated from all other surface waters.

In terms of emergent vegetated wetlands, starting with cattail marshes which evolve into shrub and forest swamps; the entire series of natural transitions are of no value to abutting surface water bodies because they lose more water than what arrives as precipitation. As such,

they are net sinks for water and clearly have a negative impact on abutting or distant downgradient surface waters in terms of navigation. Thus those emergent wetlands should not be classed as waters of the Untied States and they should not require a permit under any existing federal legislation, including the Clean Waters Act.

Respectfully submitted,

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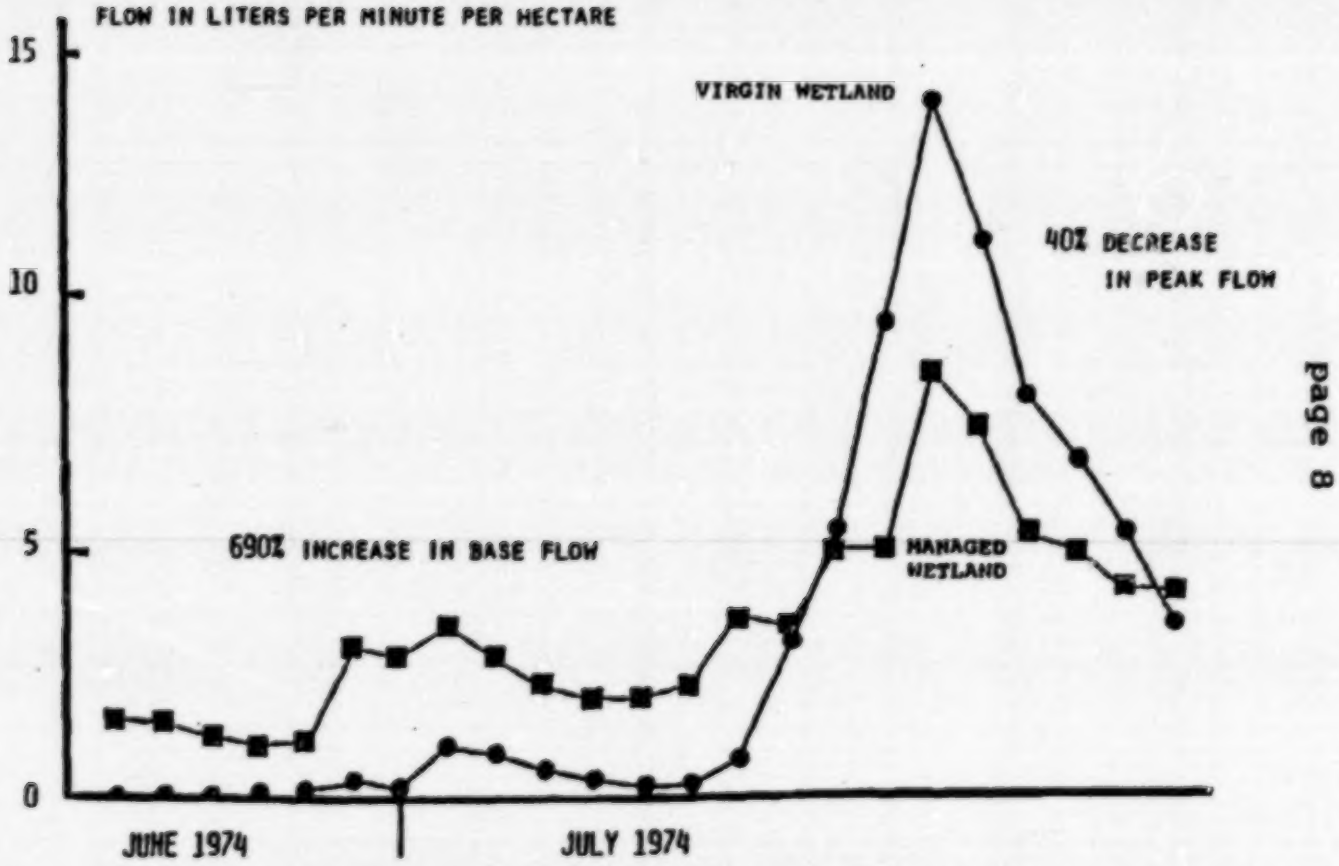

Figure 1. Comparison of Adjacent Managed Wetland with an Adjacent Virgin Wetland.

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(47) (45)

Nos. 04-1034, 04-1384

Supreme Court, U.S.
FILED
JAN 13 2006
OFFICE OF THE CLERK

In The Supreme Court of the United States

JOHN A. RAPANOS, *et al.*,

Petitioners,

v.

UNITED STATES,

Respondent.

JUNE CARABELL, *et al.*,

Petitioners,

v.

UNITED STATES ARMY CORPS OF ENGINEERS, *et al.*,

Respondents.

ON WRITS OF CERTIORARI
TO THE UNITED STATES COURT OF APPEALS
FOR THE SIXTH CIRCUIT

BRIEF FOR AMICI CURIAE THE CHESAPEAKE BAY FOUNDATION IN SUPPORT OF RESPONDENTS WITH APPENDIX

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INTEREST OF AMICUS CURIAE[1]

The Chesapeake Bay Foundation (CBF) is the only independent 501(c)(3) organization dedicated solely to restoring and protecting the Bay and its tributary rivers. Since 1967, our goal has been to improve water quality by reducing pollution. Our motto is *Save the Bay*.

Pollution is choking the Bay and many of its tributary rivers. In the summer of 2005, 41 percent of the volume of the Bay was considered a "dead zone," an area with insufficient oxygen to support marine life. The Chesapeake Bay Program, an arm of the U.S. Environmental Protection Agency (EPA), recently declared that the size of this area is the largest on record. This anoxic zone is caused in large part by excessive nitrogen and phosphorous discharges to the Bay and its tributaries. CBF strives to reduce this pollution from, among other sources, sewage treatment facilities, other industrial sources, agricultural runoff, and urban and suburban stormwater.

CBF's efforts are supported by its 140,000 members, volunteers, concerned citizens, advocates and staff. CBF's staff of 170 includes scientists, policy experts, attorneys, educators, and grassroots organizers pursues our goal through environmental advocacy, litigation, environmental education, strategic communications, and habitat restoration throughout the Bay watershed. We inform and engage the public, the private sector, and government officials to request that the necessary legislative and regulatory decisions and adequate public and private investments be made to save the Bay.

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[1] Pursuant to S. Ct. R. 37.3(a) and 37.6, the undersigned represents that (1) all parties consented to the filing of this brief, (2) no counsel for any party authored this brief in whole or in part, and (3) no person or entity other than the above-named amicus curiae and its counsel made a monetary contribution to the preparation or submission of this brief.

SUMMARY OF ARGUMENT

The purpose of this brief is to impress upon the Court that a decision to strip Clean Water Act ("CWA") safeguards from non-navigable tributaries and their adjacent wetlands will cause great harm to the Chesapeake Bay, its watershed, its aquatic ecosystem, and its people. The Chesapeake Bay is North America's largest and most biologically diverse estuary. "For more than 300 years, the Bay and its tributaries have sustained the region's economy and defined its traditions and culture."[2]

The Chesapeake Bay receives fully half of its water from an intricate network of 110,000 streams and 1.7 million wetlands most of which are non-navigable tributaries and non-tidal wetlands that drain or "tend to drain" to those tributaries, very much like the wetlands and tributaries at issue in these cases. This brief will demonstrate that the headwater streams and wetlands, and other non-navigable tributaries and associated wetlands, of the 64,000 square mile Chesapeake Bay watershed are indeed "inseparably bound up" with the Susquehanna, the Potomac, the James, and the other large navigable rivers that flow to the Bay. This intricate hydrological network cleanses the surface water, recharges the groundwater, moderates the flood flows, and provides the aquatic habitat on which the ecological and economic life of the Chesapeake Bay and its watershed depends. The health of the Chesapeake Bay truly does begin at its source.

The states of Maryland, Pennsylvania, and Virginia, the District of Columbia and the United States recognized in the 1970s that they could not solve the dire problems facing the Chesapeake Bay alone or in

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[2] Chesapeake 2000 Agreement, Preamble, at Appendix A. The signatories to the Chesapeake 2000 Agreement are Maryland, Virginia, Pennsylvania, the District of Columbia, the Chesapeake Bay Commission (representing the Maryland, Pennsylvania, and Virginia state legislatures), and the EPA, representing the United States.

piecemeal fashion. They entered into an historic compact, the Chesapeake Agreement of 1983,[3] and an expanded agreement in 1987.[4] In 2000, Congress and the state and federal Chesapeake Bay partners strengthened their commitment to restoring the Bay ecosystem with congressional action and execution of the Chesapeake 2000 Agreement.

The Chesapeake Bay partnership exemplifies the concept of cooperative federalism – a cornerstone of the CWA. The Bay partners, through the Chesapeake Bay Agreements, have set ambitious requirements to improve the water quality and restore the living resources of the Chesapeake Bay and its watershed. They recognize, however, that without CWA jurisdiction over non-navigable tributaries and adjacent wetlands, the Bay partners cannot achieve the stricter water quality standards and waste load allocations necessary to "save the Bay."

In *United States v. Riverside Bayview Homes, Inc.*, 474 U.S. 121 (1985) (*Riverside Bayview*), the Court recognized that Congress intended to regulate wetlands "inseparably bound up with the waters of the United States," and upheld the Army Corps of Engineers' exercise of CWA jurisdiction over adjacent wetlands on that basis. The Court approved this *Riverside Bayview* adjacency holding in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, 531 U.S. 159 (2001) (*SWANCC*), while narrowly holding that CWA jurisdiction did not extend to certain truly isolated intrastate ponds. The *Riverside Bayview* holding applies with equal force in this case, where the wetlands at issue drain or "tend to drain" to non-navigable tributaries that are hydrologically and ecologically bound up with downstream navigable waters. As in *Riverside Bayview*,

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[3] 1983 Chesapeake Bay Agreement, Appendix B.

[4] Chesapeake Bay Agreement of 1987, Appendix C; http://www.chesapeakebay.net/pubs/1987ChesapeakeBayAgreement.pdf (last visited January 12, 2006).

the Corps of Engineers properly asserted jurisdiction over the wetlands at issue in these cases.

The Chesapeake Bay ecosystem and the Chesapeake Bay Agreement demonstrate that the extensive networks of non-navigable tributaries and the wetlands that drain to them located upstream in watersheds are inseparably bound up with downstream navigable waters, and that the CWA goal of maintaining and restoring the physical, chemical, and biological integrity of the Nation's waters cannot be met unless these waters remain subject to the Act. For these reasons, Amicus Curiae the Chesapeake Bay Foundation respectfully requests that the Court affirm each of the decisions of the Sixth Circuit.

ARGUMENT

I. THE ECOLOGICAL AND ECONOMIC HEALTH OF THE CHESAPEAKE BAY IS "INSEPARABLY BOUND UP" WITH THE WATERSHED'S NON-NAVIGABLE TRIBUTARIES AND ADJACENT WETLANDS.

A. The Chesapeake Bay is the largest and most biologically diverse estuary in North America.

The Chesapeake Bay, a national treasure, is the largest and most biologically diverse estuary in North America.[5] It is home to more than 3,600 species of unique animals, fish, and plants including bald eagles, blue crabs, menhaden, striped bass (rockfish), osprey, oysters, and the American lotus. For more than three centuries, "the Bay and its tributaries have sustained the region's economy and defined its traditions and culture."[6]

The Bay proper is approximately 200 miles long, stretching from Havre de Grace, Maryland to Norfolk,

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[5] Chesapeake 2000 Agreement, Preamble, at Appendix A.

[6] *Id.*

Virginia. Including its tidal tributaries, the Bay has approximately 11,684 miles of shoreline. The Chesapeake Bay watershed encompasses 64,000 square miles and some or all of six states and the District of Columbia. Fifty major tributaries traverse the Appalachian, Piedmont and Atlantic Coastal Plain before flowing into the Chesapeake Bay.[7]

B. The Chesapeake Bay Watershed Is Comprised Largely of Non-navigable Streams and Adjacent Wetlands.

1. Most of the Bay watershed's stream miles are non-navigable and many flow intermittently.

One hundred and eleven thousand (111,000) miles creeks, streams, and rivers throughout the Bay watershed converge into fifty major tributaries that send water to the Chesapeake Bay.[8] The Bay's nine largest tributaries contribute 93% of the total fresh water to Chesapeake Bay,[9] about half of the Bay's total water volume.[10] The Susquehanna River is the Bay's largest tributary and contributes more than one half of the freshwater that enters the Bay.[11] The Susquehanna and its tributaries originate as small headwater streams and wetlands in New York, drain Central Pennsylvania, and

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[7] U.S. Environmental Protection Agency (EPA), *Chesapeake Bay: Introduction to an Ecosystem*, EPA 903-R-04-003 (July 2004) (*Introduction to an Ecosystem*) at http://www.chesapeakebay.net/pubs/ecosystem.pdf (last visited 1/9/06); *see*, Chesapeake Bay Watershed Map at Appendix D.

[8] Chesapeake Bay Watershed Partners Agreement (2001) at http://www.chesapeakebay.net/pubs/waterqualitycriteria/DOC_wq_finalmou.pdf (last visited January 7, 2006), Appendix D; *see also*, *Introduction to an Ecosystem* at 1, 5.

[9] U.S. Geological Survey, *Chesapeake Bay: Measuring Pollution Reduction*, Fact Sheet FS-055-95, at http://water.usgs.gov/wid/html/chesbay.html (last visited January 6, 2006).

[10] *Introduction to an Ecosystem* at 5.

[11] *Id.*

empty into the Bay in Maryland. The Potomac and James Rivers are the next two largest tributary systems flowing to the Chesapeake Bay.[12]

Each of these major Bay tributaries begins at their headwaters, far upstream of the navigable-in-fact rivers they will become. Headwaters are "the dendritic system of wetlands, swales and small streams that make up the beginnings of most watersheds."[13] Headwater streams[14] comprise the majority of streams and waters in a watershed, and they play the most important role within the watershed in improving water quality by filtering runoff, sediment, nutrients, and contaminants before they move further downstream.[15]

EPA estimates that first-order headwater streams, alone, comprise over 50% of the over 200,000 miles of

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[12] *Id.*; *See,* Chesapeake Bay Watershed Map, Appendix D. *See also,* Chesapeake Bay Program Powerpoint Presentation at www.chesapeakebay.net/pubs/waterqualitycriteria/DOC-nspresentation.ppt at slides 54, 55.

[13] Consolidated EPA Region III Response to the Advanced Notice of Proposed Rulemaking on the Clean Water Act Regulatory Definition of "Waters of the United States" (2003) (EPA Region III ANPRM Response) at 3.

[14] Headwater streams are typically defined as first and second order streams. Higher order streams are formed by the confluence of lower order tributary streams. *See,* Meyer, J. L. et al. *Where Rivers Are Born: The Scientific Imperative for Defending Small Streams and Wetlands,* American Rivers and Sierra Club, publishers (September 2003) (*Where Rivers Are Born*) at 10-11. http://www.americanrivers.org/site/DocServer/WhereRiversAreBorn1.pdf?docID=182 (last visited January 8, 2006); *see* Appendix E for stream photo.

[15] EPA Region III ANPRM Response at Appendix E, Literature Review: Extent and Function of Headwater Streams, EPA, Wheeling West Virginia (February 2003) at 3-9; *see also,* EPA letter to Jeanne Christie, dated January 9, 2005 (sent January 9, 2006) (EPA letter) *in* Amicus Curiae Brief of Association of State Wetland Managers, et al (ASWM Br.), Appendix; *see also,* M.M. Brinson, *Changes in the Functioning of Wetlands Along Environmental Gradients,* 13 (2) Wetlands 65 (June 1993); Bruce J. Peterson *et al., Control of Nitrogen Export from Watersheds by Headwater Streams.* 292 Science 86-90 (April 6, 2001).

streams in EPA Region III, which encompasses most of the Chesapeake Bay watershed.[16] The Bay watershed's extensive headwater streams are important tributaries to downstream navigable waters, but they do not always flow year round; nor do they always flow above ground. Many EPA Region III first-order streams have intermittent flow periods during the summer months or during dry years.[17]

Headwater streams in the limestone or karst regions of the Bay watershed flow underground for some length before they re-emerge as a surface stream some distance downstream. These types of streams have a definite hydrological connection to downstream navigable-in-fact rivers, though the connection is not apparent by observing surface water flows exclusively.[18] However, under Petitioners' view, these tributaries would not be subject to CWA jurisdiction and would be subject to development and contamination.

Many Bay watershed headwater streams, as well as higher order non-navigable tributaries, have been channelized over time and incorporated into ditch and stormwater systems that connect non-navigable streams and adjacent wetlands to downstream waters.[19] In two recent cases, the Fourth Circuit recognized that

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[16] EPA Region III ANPRM Response, at 10, Appendix E at 3; *see also*, Rhodes, C.A., EPA Region III, *Findings in the Mid-Atlantic Region Concerning Implications for Clean Water Act Jurisdiction for Various Interpretations of SWANCC*, Presented to the ASWM Legal Workshop, Albuquerque New Mexico, October 18, 2005 (*EPA Mid-Atlantic Findings Presentation*), at 16, 20. http://www.aswm.org/calendar/legal/rhodes.pdf (last visited January 12, 2006).

[17] *Id. See also*, EPA Letter (EPA NHD analysis indicates that 59% of the U.S. (except Alaska) stream miles have intermittent or ephemeral flow.

[18] *Id.* at 4.

[19] *See*, Council on Environmental Quality, *Environmental Trends* (1989) at 35 (estimating that 10% of perennial streams in the United States have been channelized); *Where Rivers Are Born*, at 11.